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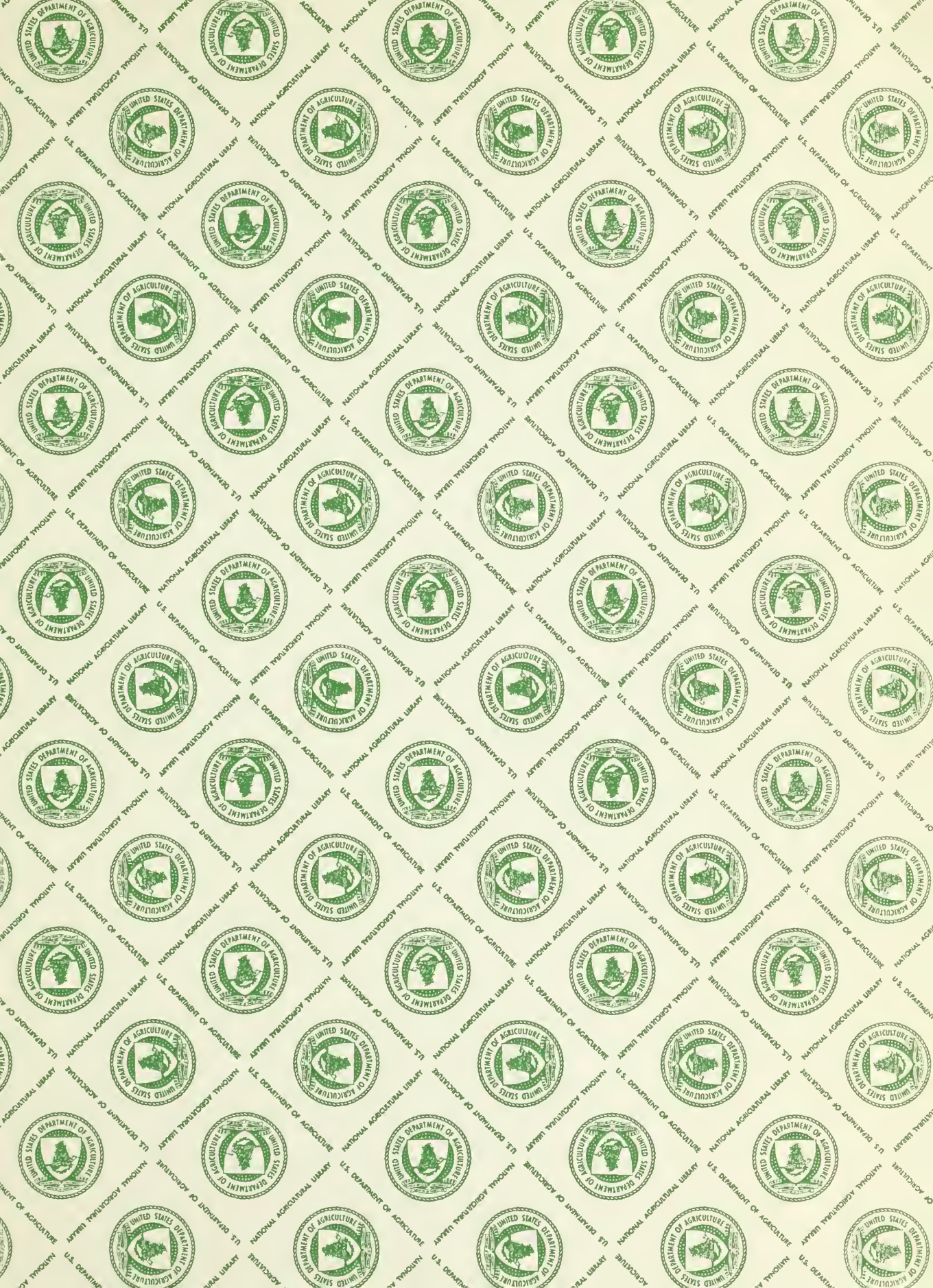
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INFORMATION SHEET ON BRINE PEELING OF VARIOUS ROOT VEGETABLES

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U. S. Department of Agriculture

This information sheet is a brief preliminary report on a method whereby operators of vegetable processing plants can peel potatoes, rutabagas, and possibly other root vegetables by scalding them in a hot saturated salt solution and then removing the peel in a suitable washer. The brine solution can be brought to a temperature higher than that of boiling water--that is, to 228° F. under sea level conditions, or 16 degrees above the boiling temperature of water. Brief immersion in the high-temperature brine bath softens the cells adjacent to the skin, thus loosening it from the vegetable. Since the method has certain advantages in comparison with other methods, it has been given experimental trial at the Western Regional Research Laboratory.

Procedure

A saturated brine solution is prepared by adding common salt (NaCl) to water in the ratio of approximately 3.3 pounds of salt per gallon of water. The weight of one gallon of the solution is about 9.6 pounds. This solution is brought to boiling temperature and the washed vegetables are held below the surface of the boiling brine solution for varying periods of time. This interval must be determined by trial for each vegetable and also for various lots of the same vegetable if the quality varies. Excessive scalding will result in high peeling losses, whereas too short a treatment will leave much peel to be removed by hand. When the vegetables have been properly scalded, the skins remain intact. These skins can then be removed by washing in a suitable washer equipped with a moderately high-pressure spray (approximately 125 pounds per square inch); the washer should tumble the vegetables vigorously, and should be designed so that loosened skins are promptly and completely ejected.

The scalding procedure can be carried out either as a batch or as a continuous process. The latter method is preferable, however, and may be accomplished through the use of a specially designed draper-type brine peeler described below. It should be pointed out that all vegetables float in a concentrated brine solution. A standard draper-type lye peeler can be used as a brine peeler provided it incorporates means for holding the vegetables below the surface while they are being conveyed through the bath, and provided the materials of construction of the machine are not affected by the concentrated salt-water solution. In some commercial trials of brine peeling serious corrosion of the equipment has been experienced; this difficulty may be minimized by the addition of sufficient caustic soda to keep the brine weakly alkaline.

Equipment

The U. S. Department of Agriculture has prepared two brine peeler designs for use with either gas or oil as a fuel. Steam is used for rapid initial heating during "start-up" periods. These units can be modified for use with indirect

steam heating. The designs are shown on USDA Drawings Nos. D-109 and D-111, and are designated as designs No. 1 and No. 2 respectively. The first design shows the construction details of a unit capable of processing approximately 8 to 10 tons of potatoes per hour, with a 6-minute retention period in boiling concentrated brine. The capacity will vary with other vegetables in accordance with time of retention. Similarly the second drawing shows the construction details of a unit capable of processing approximately 2 to 3 tons of potatoes per hour, with the same retention period. These designs may be obtained on request from the Western Regional Research Laboratory, Albany, California.

The USDA peelers operate as follows: The vegetables are held below the surface of the brine by means of a wire belt fitted with vertical advancing flights. As the product nears the discharge end of the tank, it is picked up by a draper belt. The excess salt is washed from the surface of the product by a light water spray which serves also as a make-up water supply to replace water lost through evaporation, etc. From the draper belt the product is discharged directly into the washer where the peeling is removed.

Discussion and Comparison With Other Methods

Some of the advantages of the brine method as compared with lye peeling are as follows: The salt with which brine is made costs approximately one-fifth as much as caustic soda per pound or about three-fifths as much per charge. Salt can be handled without personal hazard, whereas caustic soda may cause burns. Both salt and caustic soda are lost by adherence to the surface of the vegetable, but lye in addition gradually loses its strength by chemical reaction and consequently must be renewed more frequently than the salt. Carry-over of salt on the vegetable is not detrimental, whereas even a trace of lye left after washing is highly undesirable. Lye may cause discoloration of the surface of the product and if the treatment is too drastic will ruin it.

Excessive retention periods with either method will soften the surface too deeply and result in excessive peeling loss. The effect of high altitudes on reducing the boiling temperature of the liquid may prevent successful use of brine peeling in some localities. The method also appears to vary in effectiveness with the variety and maturity of the vegetable. Since the factors that determine success or failure are still only imperfectly understood, it is recommended that the method be tried experimentally under the proposed actual conditions of use, and with the same type of raw vegetable, before it is adopted for full-scale use.

Numerous other high-boiling liquids have been studied in addition to brine. Mineral oil is the only other fluid that has given promising results, but further study must be made before it can be recommended.